June 13, 1839.

JOHN W. LUBBOCK, Esq., V.P. and Treas., in the Chair.

The ballot for Edwin Guest, Esq., was postponed in consequence of the number of Fellows required by the Charter not being present.

The following papers were read, viz.:—

"Researches on the Tides. Tenth Series. On the Laws of Low Water at the Port of Plymouth, and on the permanency of mean water." By the Rev. W. Whewell, B.D., F.R.S., Fellow of Trinity College, Cambridge.

In this memoir the author investigates the question, how far the *mean water*, that is the height of the tide midway between high and low water, is permanent during the changes which high and low water undergo. That it is so approximately at Plymouth having been already ascertained by short series of observations, it was desirable to determine the real amount of this permanency by induction from longer series of observations. A period of six years was chosen for that purpose; and the method of discussing these observations was the same, with slight modifications, as in former researches.

The height of low water, cleared from the effects of lunar parallax, and very nearly so from those of lunar declination, and compared with the height of high water, similarly cleared, enabled the author to ascertain whether the mean water also was affected by the semi-menstrual inequality. The results of the calculation show that the height of mean water is, within two or three inches, constant from year to year: and that, for each fortnight, it has a semi-menstrual inequality amounting to six or seven inches;—the height being greatest when the transit is at 6h. and least when at 11 h.,—the immediate cause of this inequality being, that the semi-menstrual inequality of low water is greater than that of high water: this inequality, however, is probably modified by local circumstances.

These researches have also verified the theoretical deduction, that the height both of low and of high water being affected by the moon's declination, their mean height partakes of the variations in this latter element, in successive years, consequent on the change of position of the moon's orbit. At Plymouth the increase in mean low water amounts to about two inches for each degree of increase in the declination. In the high water this change is less marked.

The parallax correction of the height of low water is obtained from all years alike, by taking the residue of each observation, which remains when the semi-menstrual inequality is taken away, and arranging these residues, for each hour of transit, according to the parallax. The declination correction is obtained in a manner analogous to the parallax correction, from each year's observations, with some correction for the variation in the mean declination of the moon in each year.

"Researches on the Tides. Eleventh Series. On certain Tide

Observations made in the Indian Seas." By the Rev. W. Whewell, B.D., F.R.S., Fellow of Trinity College, Cambridge.

This paper contains the results of the examination by the author of certain series of tide observations made at several places in the Indian Seas, which were forwarded to the Admiralty by the Hon. East India Company. These localities were Cochin, Corringa River, Surat roads in the Gulf of Cambay, Gogah, on the opposite side of the same gulf, and Bassadore, in the Island of Kissmis in the Persian Gulf.

"On the Electrolysis of Secondary Compounds." In a letter addressed to Michael Faraday, Esq., D.C.L., F.R.S., Fullerian Professor of Chemistry in the Royal Institution of Great Britain, &c., &c. By John Frederic Daniell, Esq., F.R.S., Professor of Chemistry in King's College, London.

The discovery of definite electrochemical action naturally suggests the inquiry into the relative proportion of that part of a voltaic current, which, in the case of its decomposing a saline solution, is carried by the elements of the water, and that part which is carried by the elements of the saline compound, and into the definite relations, if any such there be, subsisting between the two electrolytes so decomposed. This question was the origin of the investigation which forms the subject of the present letter. The power which the author employed in this experimental inquiry was that of a small constant battery of thirty cells, six inches in height, with tubes of earthenware, charged in the manner he has described in his former communications to the Society. The result of the first experiment evidently indicated that the decomposition of one equivalent of water was accompanied by the decomposition of an exact equivalent of sulphate of soda. The author then endeavours to ascertain whether the power of the current is equally divided between what had hitherto been regarded as the two equivalent electrolytes. The first experiments he made in order to determine this point seemed to lead to the extraordinary conclusion, that the same current which is just sufficient to separate an equivalent of oxygen from an equivalent of hydrogen in one vessel, will at the same time separate an equivalent of oxygen from one of hydrogen, and also an equivalent of sulphuric acid from one of soda in another vessel.

The author then examines the remarkable phenomena relative to the transfer of matter from one electrode to the other without the decomposition of the transported compound; a phenomenon which was first observed by Mr. Porret in glass cells divided into two compartments by a diaphragm of bladder.

Having observed that the products of electrolyzation cannot be kept long separate in their respective cells, on account of the ultimate mixture of the liquids on the platinode side of the diaphragm, the author was led to construct an apparatus by which this evil is remedied much more perfectly, and to which he gives the name of *the double diaphragm cell.* It consists of two cells, formed of two glass cylinders, with collars at their lower ends, fitted by grinding